REMARKS

Applicants have now had opportunity carefully to consider the Examiner's comments set forth in the Office Action of December 11, 2008.

The Office Action alludes to certain deficiencies in the Information Disclosure Statement filed October 10, 2004, particularly related to the requisite submission of legible copies of each foreign patent document cited. The Information Disclosure Statement and copies of WO 02/34455 A1 and WO 00/72224 A1 are being re-filed to overcome any deficiencies.

The Rejections

The Office Action refers to:

Boyle et al:	US 6,586,707;
Nakazawa et al:	US 2002/0019074;
Gruzman et al:	US 4,639,572;
Yoo et al:	US 6,130,401; and
Yamanaka:	US 5,358,590.

All 50 claims are rejected in the Office Action.

Claim 48 is objected to and the claim has been reworded substantially as helpfully suggested by the Examiner, but avoiding the proposed split infinitive.

Claims 1, 2, 4-18, 20-28, 33-37 and 39-46 are rejected under 35 U.S.C. 102(e) as being anticipated by Boyle et al.

Published Application *By Another*

As a preliminary matter, the Office Action correctly identifies that Applicant Adrian Boyle is a named inventor in the present application and in the primary reference upon which the 102(e) rejections are based. Accordingly, the undersigned attorney is in the process of gathering

facts and obtaining a signed affidavit, if appropriate, pursuant to 37 C.F.R. 1.132, which would effectively eliminate the Boyle reference as prior art.

Distinguishable Subject Matter

The Office Action asserts that because Boyle discloses *"All control systems, data systems, motion systems, vision systems and beam delivery are processor controlled"* (Boyle col. 5 lines 14-15) Boyle also discloses *"providing program control means and associated data storage means for controlling the pulsed laser"* as claimed in claim 1. We submit that this is an inexcusable use of hindsight because a person skilled in the art would understand that the elements of Boyle could be each *"processor controlled"* without *"providing program control means and associated data storage means for controlling the pulsed laser"*.

Moreover, contrary to the assertion in the Office Action, we submit that the feature claimed in amended claim 1 of *"providing in the associated data storage means a laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses produced by the laser at the substrate to restrict damage to the respective at least one layer while maximising machining rate for the at least one layer"* is not disclosed by the *"machining strategy"* of Boyle (col. 5 lines 48-49) since there is no hint or suggestion in Boyle that the *"machining strategy"* is *"a laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses produced by the laser at the substrate to restrict damage to the respective at least one layer while maximising machining rate for the at least one layer"* as claimed. To the contrary, Boyle teaches in the cited passage that *"it is necessary to control the base set of laser and scan parameters and to provide a controlled machining strategy"* (Boyle col. 5 lines 47-49) not that the machining strategy controls the laser and scan parameters as the *laser cutting strategy file* does in the claimed

invention. We therefore submit that the cited passage in Boyle discloses no more than that it is necessary to control the base set of laser and scan parameters to control machining, and does not hint at or suggest a *laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses* as claimed in the present invention. We submit that this is confirmed by the fact that Figures 16 and 19 in Boyle are referred to as examples of a "machining strategy" (Boyle col. 4 lines 7-8; 13-14) and clearly Figures 16 and 19 do not represent a *laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses* as claimed in the present invention. Furthermore, Boyle discloses that, *"The speed at which this process can be conducted is a function of the laser parameters, the optical properties of the beam, the material properties, and the machining strategy used to remove the material. The machining strategy may require the laser, optical or scan parameters to change throughout the machining process"* (Boyle col. 8 lines 1-7). Clearly the disclosure is that the *machining strategy* is the outcome of controlling the laser, optical and scan parameters and not a *laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses* as claimed in the present invention. Furthermore, contrary to the assertion in the Office Action, the disclosure in Boyle that, *"In one embodiment, scan velocity, laser power and pulse overlap are chosen to control depth of material removal in any one scan"* (Boyle col. 2 lines 38-40) does not disclose a *laser cutting strategy file of a plurality of selected combinations of pulse rate, pulse energy and pulse spatial overlap of pulses* as claimed in claim 1. Moreover, there is no suggestion in Boyle, as apparently implied in the Office Action, that choosing *scan velocity, laser power and pulse overlap to control depth of material removal in any one scan* results in restricting machining rate while

maximising machining rate as claimed for the combinations stored in the laser cutting strategy file of the present invention.

The Office Action asserts that Boyle discloses storing in a strategy file a number of scans to use with a combination selected from the strategy file to cut through a layer. Since we submit there is no disclosure of a strategy file in Boyle, we submit that this assertion must be incorrect. Furthermore, in none of the references to a machining strategy in Boyle is there any reference to a number of scans required to cut through a layer, as claimed in the present invention. We therefore submit that the assertion in the Office Action is without foundation.

The Office Action further asserts in respect of claim 1 that the statement in Boyle that *"All control systems, data systems, motion systems, vision systems and beam delivery are processor controlled"* (Boyle col. 5 lines 14-15) discloses *"using the laser under control of the program control means driven by the laser cutting strategy file"* as claimed in claim 1, but since we submit that Boyle does not disclose a *laser cutting strategy file* we submit that Boyle does not disclose program-controlled laser machining and in particular does not disclose laser machining controlled by a *laser cutting strategy file.*

Moreover, the Office Action asserts that because Boyle discloses, *"the controller comprises means for directing the laser beam in a plurality of n parallel passes, said passes* <u>*being laterally offset*</u> (Boyle col. 3 lines 19-21) that Boyle discloses *"driven by the laser cutting strategy file to scan the at least one layer with the respective at least one selected plurality of scans at least to facilitate dicing of the substrate"* as claimed in claim 1. However, it is clear throughout the description and claims of the present application that the plurality of scans of the present invention necessary to cut through a layer or to dice a substrate are a plurality of

vertically spaced scans at increasing depth in the layer or substrate, and not laterally offset scans as disclosed in the cited passage of Boyle.

Furthermore, the Office Action asserts that from the disclosure in Boyle, the objective *"to machine through the wafer at the highest speed possible while meeting the required specification for edge smoothness and without reducing the mechanical strength of the wafer or substrate material"* discloses the claimed feature of claim 1 of, *"dicing of the substrate such that a resultant die has at least a predetermined die strength"*. However, machining a channel through a wafer or substrate such that the strength of the wafer or substrate is not reduced, as in Boyle, is clearly not the same as dicing a wafer to produce die with a predetermined die strength, which may or may not be less than the strength of the wafer, as in the present invention.

Finally, with respect to claim 1, the Office Action asserts that the disclosure in Boyle that, *"Mechanical machining has disadvantages such as low yield"* (Boyle col. 1 lines 14-15) and *"A defocused beam incident on the surface of the wafer generates a crack, which propagates along the dicing direction. Controlling such a process is difficult. This invention is therefore directed towards providing for improved machining of semiconductor material. The improvements specifically, are that the process throughput and quality are sufficient to allow low cost manufacturing of components as well as enabling the manufacture of precision micro-machined structures such as micro-fluidic devices"* (Boyle col. 1 lines 44-53) discloses the claimed feature of claim 1 of, *"a yield of operational die equals at least a predetermined minimum yield"*. However, we submit that the disclosed object of Boyle is to provide an improved machining method, compared with that used in dicing, in order to enable the manufacture of micro-machined structures such as micro-fluidic devices, rather than disclosing dicing which produces die with a predetermined minimum yield.

We therefore submit that claim 1 is novel with respect to Boyle. Accordingly, all the claims dependent on claim 1 are also novel.

With respect to claim 2, the Office Action asserts that Boyle discloses varying the combination of pulse rate, pulse energy and pulse overlap and measuring the resultant cutting rate, determining whether damage is restricted to a predetermined extent with the selected combination, measuring the yield and die strength of the resultant die to determine a suitable selected combination and storing that combination in the strategy file, scanning the layer to determine how many scans are necessary to cut through the layer with the stored combination and also storing that number of scans with the combination in the strategy file. We submit that none of these features is disclosed in Boyle, either in the passages cited by the Examiner, or elsewhere.

Without conceding any of the assertions made by the Office Action with respect to the remaining dependent claims, it is noted that in particular with respect to claim 5, that the Office Action seeks to equate mapping coordinates of a top-side camera to a bottom-side camera in Boyle (Boyle col. 2 line 66 – col. 3 line 4) with mapping a laser energy density received in a focal plane of the telecentric scan lens to produce a laser energy density map of a field of view of the telecentric lens. Since the telecentric lens is used to focus the laser beam in the present invention and is not used in a camera, it would appear that it is only the use of the word "map" which is common to the features disclosed in Boyle and those of claim 5, and the assertion in the Office Action has no basis. It is noted that the majority of the claimed features are understood by the Examiner, with the use of hindsight, only to be <u>implicitly</u> disclosed in Boyle.

With respect to claim 16, the Office Action asserts that Boyle discloses using a gaseous environment to control a chemical reaction to enhance strength of the resultant die. In fact, in the

cited passages, Boyle discloses the extraction of fumes and debris and the use of an assist gas directed at the material to control deposition of debris and assist the machining process (Boyle col. 3 lines 8-12) and that particulate and gaseous debris is removed from the machining region (Boyle col. 10 lines 49-57). Moreover, Boyle only discloses, *"The system also includes a sophisticated gas blowing and debris extraction system. The debris extraction device ensures that debris does not land on fiducial locations so that accurate vision and alignment is possible. The gas assist device ensures that debris is directed away from the machining front and from the topside of the wafer into a debris extraction system. The gas assist device also improves machining speed when the gas jets are directed along a cut."* (Boyle col. 4 lines 49-56). Thus the gas handling system of Boyle appears to provide only the physical removal of debris. There is therefore no suggestion in Boyle of, *"using the gaseous environment to control a chemical reaction with the substrate at least one of prior to and during dicing the substrate to enhance a strength of the resultant die"* as claimed in claim 16. We submit that the Examiner's further speculation that this removal of debris enhances the strength of resultant die has no basis in the disclosure.

With respect to independent claim 33, the Office Action makes a number of assertions which correspond with assertions made in respect of claims 1 and 5, and we make corresponding responses to those made in respect of claims 1 and 5. In addition, we note that contrary to the assertion in the Office Action, there is no suggestion or hint in the cited passages of Boyle of *"using the selected combination of pulse rate, pulse energy and pulse spatial overlap of pulses for storing the laser energy density map as an array in the data storage means for modifying the at least one respective selected combination to compensate for irregularities, introduced by the telecentric lens"* as claimed in claim 33.

We therefore submit that independent claim 1 and the claims dependent thereon and independent claim 33 and the claims dependent thereon are novel with respect to Boyle.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boyle and Nakazawa

The Office Action asserts that Boyle discloses at col. 5 line 44 that die strength is measured whereas Boyle actually discloses machining a wafer without reducing the strength of the wafer and therefore discloses nothing about measuring the strength of a die cut from the wafer.

Claims 19 and 38 are rejected under 35 U.S.C. 103(a) as being patentable over Boyle in view of Gruzman.

However, in respect of claim 19, this rejection is predicated on the assertion, which we have refuted, that Boyle discloses all the features of claims 1 and 16 on which claim 19 depends. We therefore submit that claim 19 is inventive with respect to a combination of Boyle and Gruzman, should such a combination be allowable, which we do not concede. By similar reasoning, we submit that claim 38 is inventive over Boyle and Gruzman.

Claims 29 and 47 are rejected under 35 U.S.C. 103(a) as being patentable over Boyle in view of Yoo et al.

However, in respect of claim 29, this rejection is predicated on the assertion, which we have refuted, that Boyle discloses all the features of claim 1 on which claim 29 depends. We therefore submit that claim 29 is inventive with respect to a combination of Boyle and Yoo et al, should such a combination be allowable, which we do not concede. By similar reasoning, we submit that claim 47 is inventive over Boyle and Yoo et al.

Claims 30-32 and 48-50 are rejected under 35 U.S.C. 103(a) as being patentable over Boyle in view of Yamanaka.

However, in respect of claims 30-32, this rejection is predicated on the assertion, which we have refuted, that Boyle discloses all the features of claim 1 on which these claims ultimately depend. We therefore submit that claims 30-32 are inventive with respect to a combination of Boyle and Yamanaka, should such a combination be allowable, which we do not concede. By similar reasoning, we submit that claims 48-50 are inventive over Boyle and Yamanaka.

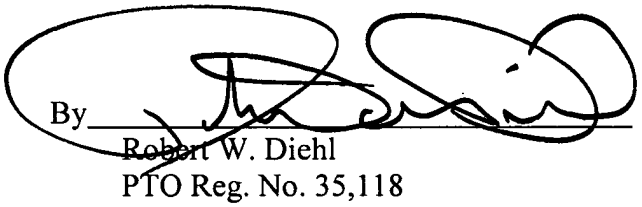
CONCLUSION

For at least the reasons detailed above, it is submitted that the claims in the amended application are in condition for allowance. The foregoing comments and amendments do not require additional search or examination.

The undersigned attorney of record hereby authorizes charging of any necessary fees, other than the issue fee, to the Deposit Account No.19-1351.

If the Examiner finds a personal contact advantageous to the disposition of this case, the Examiner is invited to call the undersigned at the telephone number listed below.

Respectfully submitted,



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